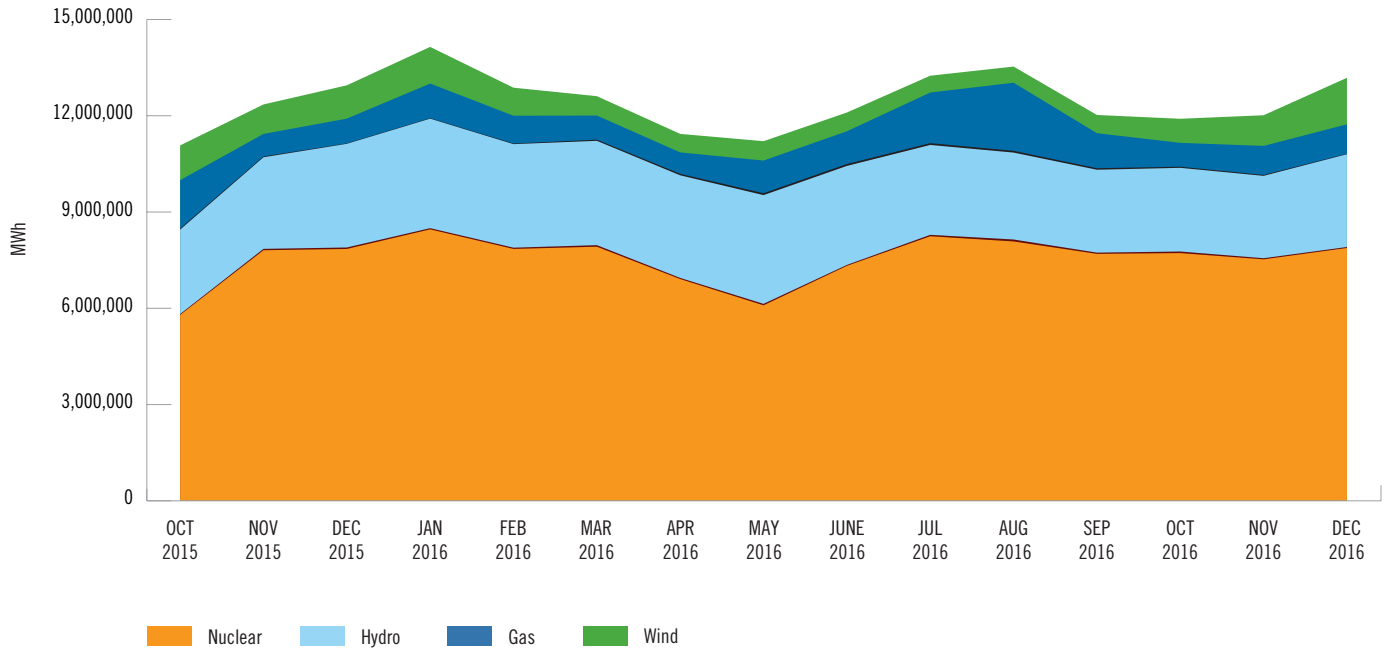


Electricity Supply

Monthly Energy Grid Output by Fuel Type (MWh)

Ontario’s bulk electricity grid has a diverse supply mix, featuring baseload generators that provide energy around the clock, intermittent generators that generate when they are able (primarily wind and solar), and flexible generators that can change their output quickly (primarily natural gas).



Note: Total MW value may not add up to sum of column totals due to rounding.

Source: IESO

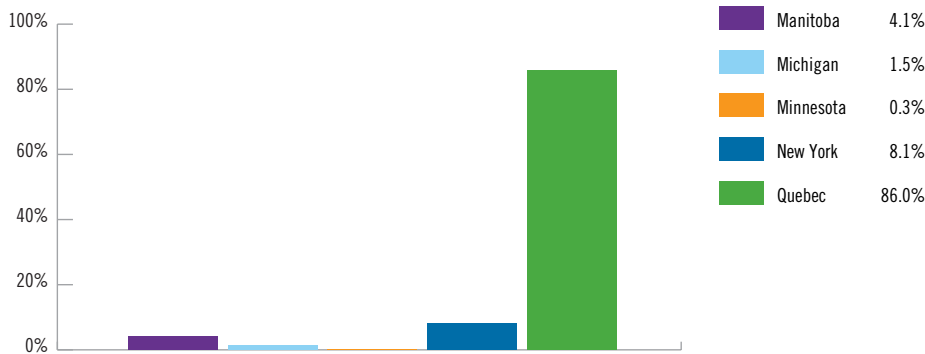
The data shown above is sourced from a report developed by the IESO, available at http://reports.ieso.ca/public/GenOutputbyFuelMonthly/PUB_GenOutputbyFuelMonthly.xml. The report uses settlement data to provide information for all self-schedulers, intermittent and dispatchable Ontario generators registered as a Market Participant. The report — which includes all grid-connected generators, plus those embedded generators that are also registered as market participants — is published monthly as per the Physical Settlement calendar.

Imports and Exports

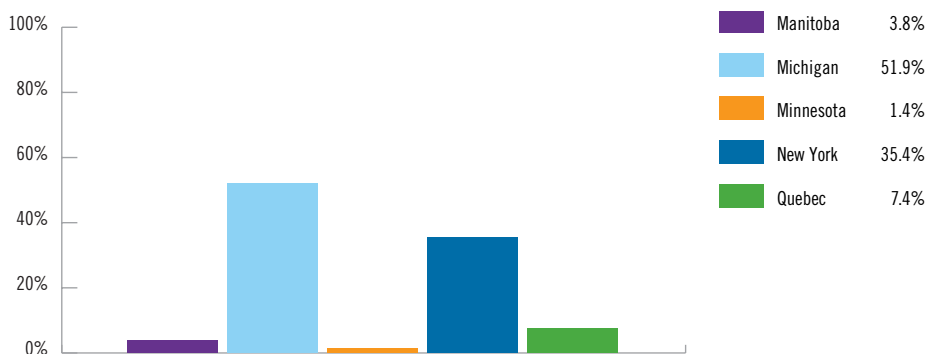
Ontario is connected to a large, stable network of transmission systems across North America, which supports system reliability and economic efficiency. Imports compete against domestic generation to provide energy at the best possible price and to support the province’s needs during periods of high demand. Ontario also exports energy when prices are higher, which helps to bring in revenue that helps offset other system and infrastructure costs and can help maintain system reliability during times of surplus generation.

Ontario imports and exports power across 26 interties with two provinces and three states. While Ontario is electrically interconnected with Manitoba, Michigan, Minnesota, New York and Quebec, the interties allow for electricity trade in transactions that can reach across eastern North America, contributing to a more diversified and competitive pool of supply.

Imports



Exports



Q4 (GWh)	Manitoba	Michigan	Minnesota	New York	Quebec	Total
Imports	249	16	43	28	1,376	1,713
Exports	357	2,819	123	1,854	526	5,679

Note: Numbers may not add up to totals due to rounding.

Source: IESO

Installed Capacity Connected to Transmission Grid

Changes to installed transmission grid capacity in this quarter highlight the continuing process of renewal in Ontario’s electricity sector. While nuclear, hydroelectric and natural gas production accounted for the vast majority of bulk supply, new wind, biofuel and solar generators continued to connect to the transmission grid.

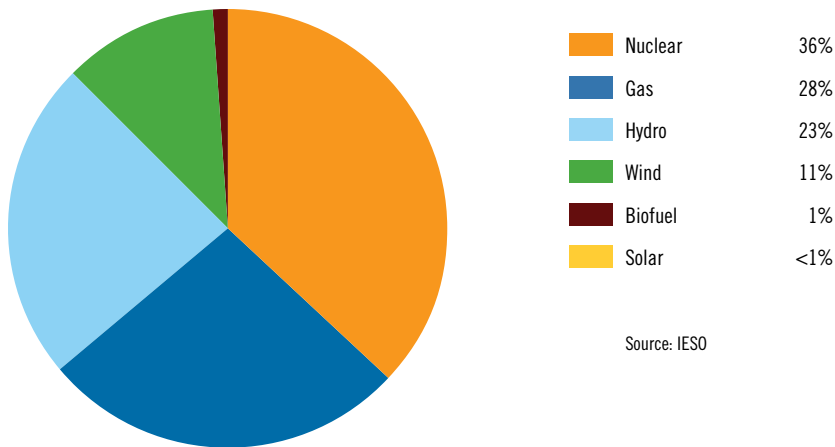
The [IESO Active Generation Contract List](#) provides the status of individual contracted electricity supply projects within different IESO procurement programs. The list is limited to generation facilities under contract to the IESO.

New Facilities Registered in Q4

The following projects have completed commissioning and the market entry process and are included as part of total installed IESO Market Participant generator capacity:

- Lower White River Generating Station - 10.1 MW
- Upper White River Generating Station - 8.8 MW

Grid-Connected Generation Capacity



Note: Data include all transmission-connected generation facilities and distribution-connected facilities that are Market Participants. Numbers may not add up to totals due to rounding.

The table below shows the increased use of renewable resources for generating electricity in the province.

Grid-Connected Generation Capacity

Year	Nuclear	Hydro	Coal	Gas*	Wind	Biofuel	Solar	Total
2016 (MW)	12,978	8,451	0	9,943	3,923	495	280	36,070
2015 (MW)	12,978	8,432	0	9,942	3,504	495	240	35,591
2014 (MW)	12,947	8,462	0	9,920	2,543	455	40	34,367
2013 (MW)	12,947	7,939	2,291	9,920	1,725	124	0	34,946
2012 (MW)	12,998	7,947	3,293	9,987	1,511	122	0	35,858
2011 (MW)	11,446	7,947	4,484	9,549	1,412	122	0	34,960

* Units that use natural gas, oil or are dual fuel, such as Lennox, NP Kirkland and NP Cochrane, are included in the Gas category.

Note: Numbers may not add up to totals due to rounding.

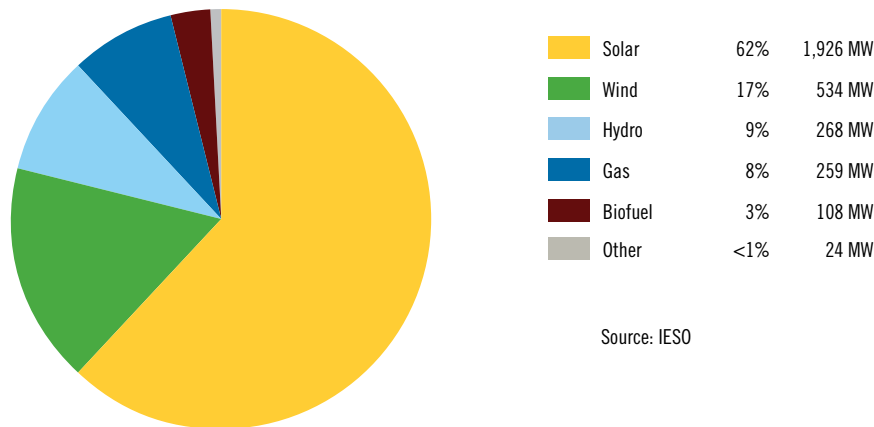
Source: IESO

Embedded Generation (IESO-contracted)

Embedded generators supply electricity to local distribution systems, helping to reduce demand on the transmission grid and supporting some of the needs of local communities. While wind and solar make up the majority of contracted embedded generation, the IESO has contracted for increasing amounts of hydroelectric, combined heat and power, natural gas and biofuel systems that will also connect to local distribution networks.

By the end of Q4 2016, there was 3,138.5 MW of contracted generation in commercial operation within local distribution systems.

Contracted Embedded Generation Capacity in Commercial Operation (at end of Q4)

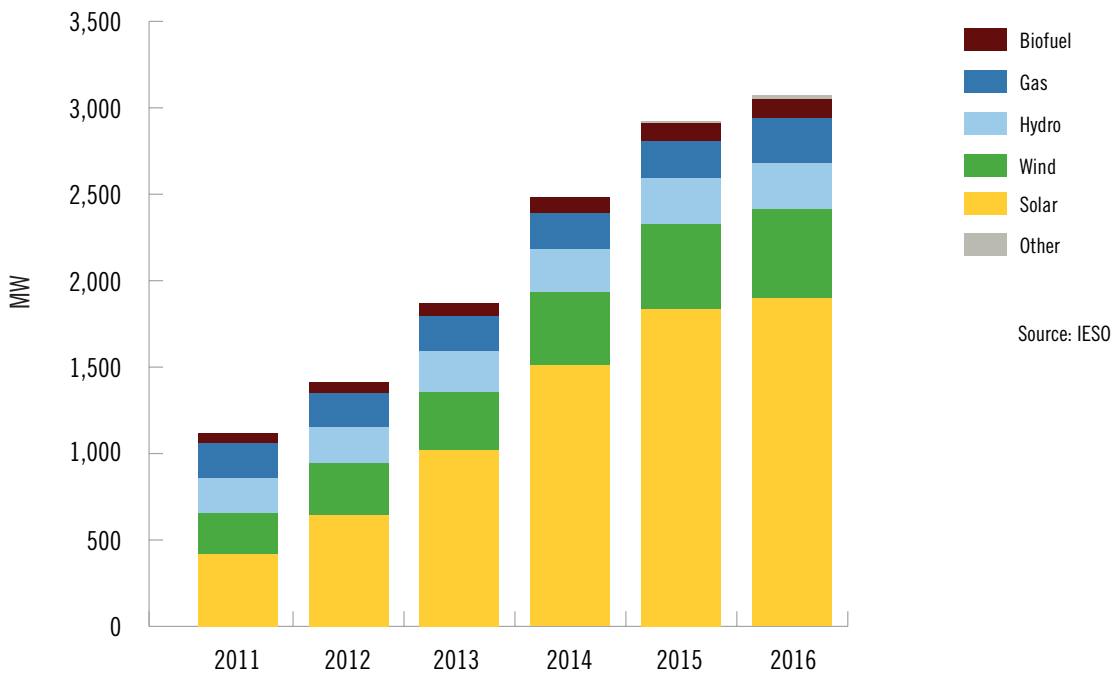


Source: IESO

Note: Numbers may not add up to totals due to rounding.

The table below shows the increased use of embedded generation to supply electricity to local distribution systems in the province.

Contracted Embedded Generation Capacity in Commercial Operation



Source: IESO

Note: Total IESO-contracted embedded generation in commercial operation at end of each period. Numbers may not add up to totals due to rounding.

The data shown above are sourced from the IESO Progress Report on Contracted Supply. The report provides a quarterly update on the status of supply and procurement initiatives that are under development or in commercial operation, by fuel type, and aggregates total capacities as stated in each contract, which differs from values on installed capacity used for operation purposes. The report is available at <http://www.ieso.ca/Documents/Supply/Progress-Report-Contracted-Supply-Q42016.pdf>.

Total Grid-Connected and Contracted Embedded Generation Capacity

This chart shows all grid-connected capacity and IESO-contracted capacity in the province. It is calculated by adding the two capacity categories listed above.

Year	Nuclear	Hydro	Coal	Gas	Wind	Biofuel	Solar	Total
2016 (MW)	12,978	8,719	0	10,202	4,457	603	2,206	39,188
2016 (%)	36%	22%	0%	26%	11%	2%	6%	

Note: Numbers may not add up to totals due to rounding.

Source: IESO

Available Capacity at Peak

29,828 MW (Q4)

Peak Demand	20,688 MW (Q4)	Operating Reserve Requirement	1,640 MW (Q4)
Minimum Demand	10,663 MW (Q4)		

Source: IESO

Available capacity is all installed grid-connected capacity, less allowances made for seasonal derates, planned outages and the capacity of energy-limited resources. Reserves are required to ensure that the forecast Ontario Demand can be supplied with a sufficiently high level of reliability. Operating Reserve is the amount of supply resources required to handle the loss of the largest contingency on the grid, plus the loss of half the amount of the second largest contingency. More information on the criteria, tools and methodology the IESO uses to perform resource adequacy assessments can be found at http://www.ieso.ca/Documents/marketReports/Methodology_RTAA_2015jun.pdf.

Conservation

As part of the Conservation First Framework (CFF) for 2015-2020, the province established a target of 7 terawatt-hours (TWh) in electricity savings² to be achieved through conservation programs offered by local distribution companies (LDCs). The province also established a target of 1.7 TWh to be achieved through the Industrial Accelerator Program (IAP), which is delivered by the Independent Electricity System Operator (IESO) to transmission-connected customers. Overall the province expects to achieve 8.7 TWh in savings by December 31, 2020.

As of 2016 quarter 4, LDC delivered CFF Programs have achieved 1,923 GWh representing 27% of the 2020 CFF target and the IESO delivered IAP Program has achieved 196 GWh representing 12% of the 2020 IAP target. For more details on quarterly results please see the quarterly IESO Conservation Progress Report via the IESO Conservation Reports website: <http://ieso.ca/power-data/conservation-overview/conservation-reports>.

Conservation Portfolio Progress – Results (as of 2016 Q4)³

Incremental Progress		2016 Q4 Incremental	2015-2016 Incremental	2020 Target Progress (%)
LDC Delivered Programs	Net Peak Demand Savings (MW)	12	277	-
	Net Energy Savings (GWh)	97	1,923	27
IESO and other Non-LDC Programs	Net Peak Demand Savings (MW)	3	24	-
	Net Energy Savings (GWh)	26	196	12
Total Peak Demand Savings (MW)		15	301	-
Total Energy Savings (GWh)		122	2,119	-

Note: Numbers may not add up to totals due to rounding.

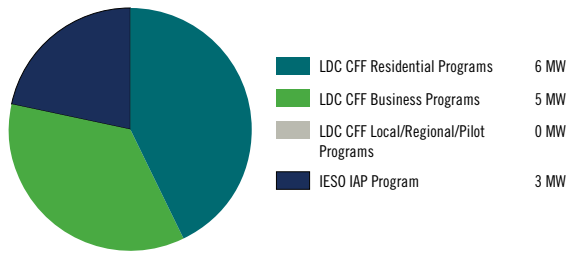
Source: IESO

2. All conservation metrics above are presented as 'net' savings which take into consideration the actual influence of the program on participants (e.g., estimating free-ridership and spill over savings). Furthermore, all savings presented above persist until the year 2020 at the end-user level (e.g., accounting for transmission and distribution system line losses). To align savings with generation level metrics, values should be increased by factor of 6.7% for distribution system level savings or a factor of 2.5% for transmission system level savings.

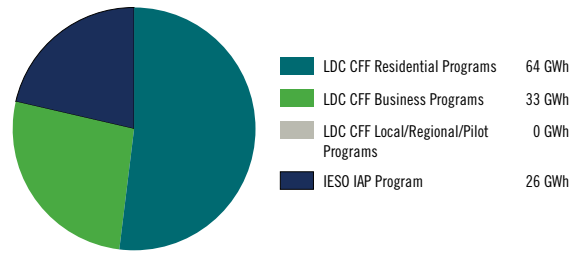
3. Results presented are 'reported' (i.e. 'unverified') based on project installation dates corresponding to the indicated period and are based on projects reported and invoiced to the IESO as of 2016 Q4

Incremental Savings (2016 Q4)

Peak Demand Savings



Annual Energy Savings



Note: Numbers may not add up to totals due to rounding.

Source: IESO

Demand Response (DR)

Demand response and peak savings programs benefit the electricity system and lower energy costs for consumers by contributing to overall peak savings for the province.

Demand response in the wholesale market is being transitioned from the contract-based Capacity-Based Demand Response (CBDR) program to an annual DR Auction. The DR Auction provides a transparent and cost-effective way to select the most competitive providers of DR, while ensuring that all providers are held to the same performance obligations. This structural change facilitates the entry of new DR suppliers and provides the IESO with greater flexibility to respond to changing system conditions and needs. As the capacity from CBDR contracts expire, that expiring capacity will be made available for competitive selection in the DR Auction.

The second annual DR auction was held in December 2016 and successfully secured 445.2 MW and 477.5 MW of DR capacity for the upcoming summer and winter commitment periods, respectively, which will become available in May 2017. The auction resulted in both increased participation and prices for DR capacity that are 12 to 17 percent lower than those achieved in 2015. For the first time, residential homeowners, participating through an aggregator, were eligible to take part in the auction.

More information on the Demand Response Auction is available at: <http://www.ieso.ca/Pages/Participate/Demand-Response-Auction>

Peak Savings

The Industrial Conservation Initiative (ICI) encourages large consumers to shift their energy use away from system-wide peaks. Customers who are able to reduce their impact on peaks benefit the system by reducing the need to build new infrastructure. Participating customers are assessed an individual Global Adjustment (GA) rate, based on the percentage that their demand contributes to the top five system coincident peaks measured during a defined base period.

The table below lists the top five daily peaks for the most recent base period, which began on May 1, 2015, and ended on April 30, 2016.

Industrial Conservation Initiative Coincident Peak Values (for base period May 1, 2015 to April 30, 2016)

Date	Hour Ending	Net Ontario Load (MW)	Embedded Generation (MW)	Total (MW)
July 28, 2015	17	22,015.634	1,008.076	23,023.710
July 29, 2015	17	21,899.846	935.595	22,835.441
August 17, 2015	17	21,882.182	1,010.057	22,892.239
July 27, 2015	18	21,561.628	761.649	22,323.277
September 3, 2015	14	21,428.697	1,431.536	22,860.233

Note: The value in the Total (MW) column is the number used to calculate a customer's Peak Demand Factor. The above values are used for the adjustment period July 1, 2016 to June 30, 2017.

Source: IESO

Information on peak tracking can be found at <http://www.ieso.ca/sector-participants/settlements/global-adjustment-for-class-a>

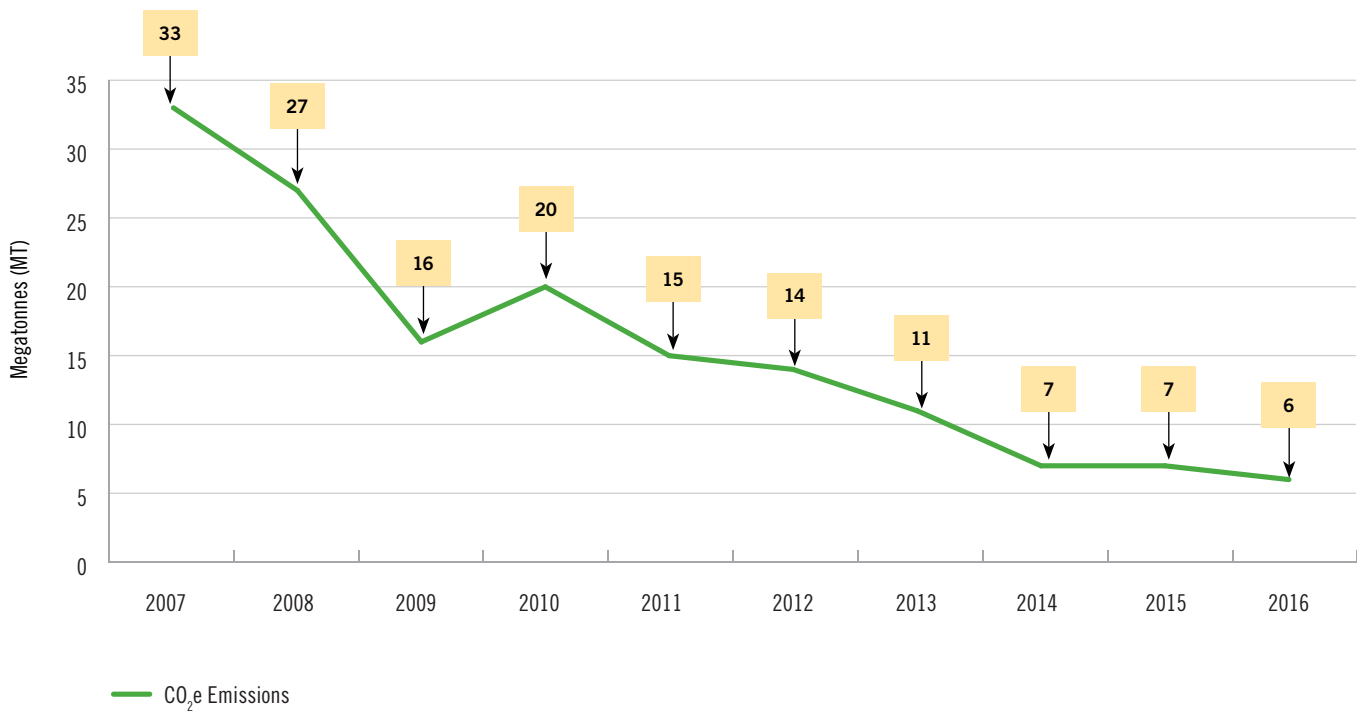
More information on the ICI is available at <http://www.ieso.ca/sector-participants/settlements/global-adjustment-class-a-eligibility>

Greenhouse Gas Emissions

The marked decline in greenhouse gas emissions is a result of the phase-out of coal-fired electricity generation in the province and uptake of renewable generation and conservation measures. Emissions of oxides of sulphur (SO_x) – which are predominantly a by-product of coal combustion – have also shown a marked decrease with the phase-out of coal-fired electricity.

CO₂ Emissions for the Ontario Electricity Sector

The chart below shows annual CO₂ emissions for the years 2007-2016. Year-to-date CO₂ emissions in Q4 2016 totalled 6 Megatonnes (MT).



Source: IESO, Environment Canada

Air Contaminants

Air contaminants, including oxides of sulphur (SO_x), oxides of nitrogen (NO_x) and fine particulate matter (PM_{2.5}), are also released during combustion of fossil fuels.

Air Contaminants for the Ontario Electricity Sector (Tonnes)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016 Q4
SO _x Emissions	105,420	76,020	30,768	38,448	11,971	10,342	10,192	847	620	462
NO _x Emissions	43,846	38,314	24,389	28,130	18,988	19,077	17,183	11,520	8,877	7,630
PM _{2.5} Emissions	1,876	1,314	1,779	2,120	562	478	439	281	249	215

Source: IESO, Environment Canada